Texas Department of Health Foodborne Illness Chart (Agents listed by first symptoms and onset)

Pathogen/ Poison/ Toxin	Symp-tom onset	Symptoms (by frequency)	Implicated foods or common vehicles	Habitat/ Reservoir	Specimen source [A B C D]	Minimum amount	Laboratory/Diagnostic tests	Storage & transport instructions [E]	Special instructions
Upper Gastrointestinal Symptoms (nausea, vomiting)									
Metallic salts & heavy metals e.g. copper, zinc, tin, cadmium	<1h	N, V, altered taste sensation	Lemonade, punch, wine, gelatin dessert containing fruit, beer, carbonated drinks	Metallic containers	Blood,[1] urine,[1] vomitus,[1] food[2]	1ml blood in purple top test tube	Metal levels [A]		Call Environmental epidemiologist at 512-458-7269
Nitrites	1-2h	N, V, cyanosis, HA, dizziness, dyspnea, trembling, weakness, fainting	Spinach & other row crops kept moist at room temperature	Nitrification of fields where plants are grown prior to harvest	Food[2]		Nitrite level [A]		Call Environmental epidemiologist at 512-458-7269
Staphylococcus aureus heat stable enterotoxin	0.5-8h mean 2-4h	N, V, D, P, prostration	Meat, seafood, pasta, or salads & sandwich spreads made with eggs or mayonnaise	Nose, throat, skin, food stored at >40 ºF	Stool,[1,2] food,[2] wound,[1,2] vomitus,[1,2] throat swab[1,2]	100g food (4oz)	Culture,[1,2] (PFGE if pre-approved by TDH),[2] toxin assay,[2] colony count [1,2]	Food kept at 2-8 ºC (35-46 ºF); shipped on ice; fully saturate swab for stool, wound, and throat sample; place in Cary-Blair medium	Food<3d old; contact lab[2] for instructions; food specimens accepted only from public health officials or physicians
Bacillus cereus heat stable emetic toxin	1-5h usual 2-4h	N, V	Starchy food, rice, salads, custards, cereals, pudding, soups	Soil, dust, spices, food stored at >40 ºF, spore survives heat	Food[2]	100g food (4oz)	Colony count,[2] identification [2]	Refrigerate specimen at 0-4 ºC (32-39 ºF); **do not freeze specimen**	Food specimens accepted only from public health officials or physicians
Amanita phalloides mushroom heat stable toxin	6-24h	N, V, D, thirst, pupil dilatation, collapse, coma	Food containing mushrooms	Amanita mushrooms (May-June)	Food		Mushroom species identification		Call IDEAS epidemiologist at 512-458-7676
Streptococcus pyogenes	12-72h	Sore throat, F, N, V, runny nose, rash	Milk, deviled eggs, or salads & sandwich spreads made with eggs or mayonnaise	Nose, throat, skin	Food,[2] stool,[1] throat swab,[1] wound swab[1]	100g food (4oz)	Culture,[1,2] identification[1,2]	Food kept at 2-8 ºC (35-46 ºF); shipped on ice; fully saturate swab for stool, wound, and throat sample; place in Stuarts or Aimes medium	Food<3d old; contact lab[2] for instructions; food specimens accepted only from public health officials or physicians
Lower Gastrointestinal Symptoms (diarrhea, abdominal cramps/pains)									
Vibrio cholerae O1, O139, & *Vibrio* non-O1	hrs-5d usual 2-3d	Watery diarrhea (rice water stools) C, N, V	Food & water contaminated with feces or vomitus; raw or improperly cooked seafood	Shellfish, copepods, or other zooplankton in brackish waters or estuaries	Stool,[2] rectal swab,[2] food,[2] shellfish,[2] serum[1]	100g food, 150g shellfish, 15 unshucked oysters	Culture,[2] identification,[2] typing,[2] toxin testing,[2] paired sera for *Vibrio* antibodies[3]	Refrigerate food sample at 0-4 ºC (32-39 ºF); stool or rectal swab transported in Cary-Blair medium	Food<3d old; shellfish accepted only from public health officials

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Vibrio parahaemo-lyticus	4-30h usual 12-24h	D, C, HA, V, F, wound infections, sepsis	Raw and undercooked seafood	Salt water shellfish; food stored at >40 °F	Stool,[2] shellfish[2]	150g food, 15 unshucked oysters	Culture,[2] identification[2]	Stool transported in Cary-Blair medium; refrigerate food at 0-4 °C (32-39 °F); transport on wet ice and **test within 24h**	Food<3d old; shellfish accepted only from public health officials
Bacillus cereus heat labile diarrheal toxin	6-24h	D, C, and sometimes N, V	Starchy food, rice, salads, custards, cereals, pudding, soups	Soil, dust, spices; food stored at >40 °F; spore survives heat	Food,[2] stool[2]	100g food (4oz)	culture,[2] identification,[2] colony count[2]	Refrigerate food sample at 0-4 °C (32-49 °F); **do not freeze specimen**	Food specimens accepted only from public health officials
Clostridium perfringens heat stable spore	6-24h usual 10-12h	C, D	Meat & poultry dishes, sauces, gravies	Dust, soil, human and animal GI tracts; food stored at >40 °F; prefers low oxygen	Stool,[2] food[2]	100g food (4oz)	Culture,[2] identification,[2] colony count[2]	Refrigerate stool and food at 0-4 °C (32-39 °F); **do not freeze specimen**	Food<3d old; food specimens accepted only from public health officials
Salmonella all serotypes	6-72h usual 12-36h	D, C, F, N, V, HA	High protein foods: meat, poultry, fish, eggs	Human & animal intestinal tracts; food stored at >40 °F	Stool,[2] food,[2] blood[2]	100g food (4oz)	Culture,[2] serotyping,[2] identification,[2] PFGE[2]	Stool in Cary-Blair medium	Food<3d old; food specimens accepted only from public health officials
Enteric viruses: *Norwalk*-like	10-50h usual 1-2d	F, N, V, P, D, HA	Shellfish, salads, clams, oysters, food handled by infected person	Humans	Fresh stool[2]	1-10g stool sample in sterile plastic container	Electron Microscopy (testing for outbreak investigations only)	Collect specimen in sterile plastic container; keep at 4 °C (39 °F); **ship to lab immediately**	Collect specimen **within 48h after symptom onset**; obtain approval for testing at virology (512) 458-7318.
Escherichia coli (non-O157)	12-72h	D, C, N	Meats, cheeses, fecally contaminated food	Human & animal (cattle) feces; can grow at refrigeration temperatures	Stool,[2] food[2]	100g food (4oz)	Culture,[2] identification,[2] toxin detection,[2] PFGE[2]	Stool in Cary-Blair medium; ship food cold at 4 °C (39 °F); **do not freeze specimen**	
Shigella species	1-7d usual 1-3d	D, C, F, N, V	Moist mixed foods, salads, milk, beans, food handled by infected person	Humans	Stool,[2] food,[2] blood[1]	100g food (4oz)	Culture,[1,2] PFGE,[2] grouping[2]	Stool in Cary-Blair medium	Food<3d old; food specimens accepted only from public health officials
Yersinia enterocolitica or *pseudo-tuberculosis*	3-7d usual 4-6d	D, F, P, N, V, mimics appendicitis	Pork, milk, tofu, poultry, beef	Pigs, cattle, poultry; grows at 35-40 °F; sensitive to heat at 122 °F	Stool,[2] blood,[1,2] tissue[1,2]	100g food (4oz)	Culture,[1,2] identification[1,2]	Saturate swab with stool and place in Cary-Blair or CIN culture medium	Food<3d old; food specimens accepted only from public health officials

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Cyclospora species	1-11d median 7d	D, C, fatigue, N, weight loss; can be shed in stool for more than 28	Contaminated water, food, and raw produce	Water	Stool[2]	Use O & P kit	Acid fast stain exam,[2] O & P exam[1,2]	Stool transported in PVA & formalin (O & P kit)	Stool specimens accepted only from public health officials
Campylobacter jejuni	1-10d usual 3-5d	D, C, N, F, HA, malaise, bloody D	Meat, poultry, milk, mushrooms; food stored at >86 °F	Foods of animal origin	Stool,[1,2] food,[2] rectal swab[1,2]	100g food (4oz)	Culture,[1,2] identification [1,2]	Stool in Cary-Blair medium; ship food cold at 4 °C (39 °F); **do not freeze specimen**	Stool & food specimens only accepted from public health officials
Cryptosporidium parvum	1-12d mean 7d	D, C, N, F, fatigue, HA, V	Any food handled by infected person; fecally contaminated water	Humans, cattle, other domestic animals	Stool[1,2]	Use O & P kit	Acid fast stain exam,[1,2] O & P exam[1,2]	Stool in PVA & formalin (O & P kit)	Stool specimens accepted only from public health officials
Escherichia coli O157:H7	3-8d	Bloody D and C, hemolytic uremic syndrome	Meats, cheeses, unpasteurized milk, cider, juices, manure fertilized fruits & vegetables	Human & animal (cattle) feces; can grow at refrigeration temperatures	Stool,[2] food[2]	100g food (4oz)	Culture,[2] identification,[2] toxin detection,[2] PFGE[2]	Stool in Cary-Blair medium; ship food cold at 4 °C (39 °F); **do not freeze specimen**	
Giardia lamblia	3-25d median 7-10d	D, mucoid fatty stools, gas, C, fatigue, N; shed for months in stool	Food handled by infected person; fecally contaminated water	Humans and other animals	Stool[1,2]	Use O & P kit	Trichrome stain exam[1,2]	Stool in PVA & formalin (O & P kit)	Stool specimens accepted only from public health officials
Entamoeba histolytica	1-8w usual 2-4w	Mucoid or bloody D, F, chills, C	Food handled by infected person; fecally contaminated water	Humans	Fresh stool[2]	Use O & P kit	Culture,[1,2] identification,[1,2] stool trichrome stain exam[1,2]	Stool collected **within 5 hours** and placed in PVA & formalin (O & P kit)	
Taenia saginata	3-6m	Nervousness, insomnia, P, anorexia, weight loss	Raw or undercooked beef products, food contaminated with tapeworm eggs	Intermediate host cattle; human definitive host	Stool[1,2]	Use O & P kit	Identification of parasite segments in stool[1,2]	Stool in PVA & formalin (O & P kit)	Stool specimens only accepted from public health officials
Taenia solium	3-6m	Nervousness, insomnia, P, anorexia, weight loss	Raw or undercooked pork meats, food contaminated with tapeworm eggs	Intermediate host pigs; human definitive host	Stool[1,2]	Use O & P kit	Identification of parasite segments in stool[1,2]	Stool in PVA & formalin (O & P kit)	Stool specimens only accepted from public health officials
Neurological and/or Gastrointestinal (visual disturbances, vertigo, tingling, paralysis)									
Shellfish toxin	0.5-3h usual< 1h	Paresthesias, reversal of hot-cold sensation, muscle aches, D, V	Shellfish, mollusks	Shellfish, mollusks	Shellfish,[2] urine,[1] blood[1]	150g shellfish, 15 unshucked	Toxin assay[C]	Refrigerate food specimen at 0-4 °C (32-39 °F) or freeze	Food specimens accepted only from public health officials

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Muscaria-type mushrooms	0.25-2h usual< 1h	Salivation, perspiration, pupil dilatation, and wheezing	Foods containing mushrooms	Mushrooms (May-June)	Mushrooms		Mushroom species identification		Call IDEAS epidemiologist at 512-458-7676
Organophosphate (pesticide)	<1h	N, V, C, D, HA, nervousness, blurred vision, chest pain, cyanosis, confusion, twitching	Contaminated foods	Plants sprayed with pesticides or foods stored in the same area with pesticides	Food,[2] whole blood[1]		Chemical analysis,[2] red cell cholinesterase activity[1]		Call Environmental epidemiologist at 512-458-7269
Ciguatera toxin	1-48h usual 1-6h	Tingling, numbness, dry mouth, pupil dilatation, blurred vision, paralysis	Large predatory reef fish; barracuda, snapper, amberjack, grouper	Large predatory reef fish	Fish,[2] mollusks[2]				Call IDEAS epidemiologist at 512-458-7676
Clostridium botulinum neurotoxins	2h-6d usual 12-36h	Blurred vision, muscle weakness, cranial nerve palsies, descending paralysis, mental status changes, respiratory distress, possible death. In infants "floppy baby syndrome"	Home-canned foods, alkaline foods, lightly cured refrigerated foods, smoked fish. In infants: honey, molasses, and syrups	Soil, plants, marine sediments, and fish	Food,[2] stool,[2] vomitus,[2] gastric aspirate,[2] serum[1,2]	100g food, 10ml blood, or 5ml serum	Culture,[2] toxin assay,[2] toxin typing[2]	Collect representative food specimen, keep at 4 °C (39 °F); ship specimen **on cold packs. Do not use dry ice. Do not freeze specimen.** Hold all other suspect canned foods until testing is completed then dispose of properly	Call IDEAS epidemiologist at 512-458-7676 AND TDH LABORATORY AT: 512-458-7318
Organic mercury, lead, arsenic	>72h	Numbness, leg weakness, spastic paralysis, impaired vision, blindness, coma	Crab, shellfish, fish, marine invertebrates	Crab, shellfish, fish, marine invertebrates	Urine		Chemical analysis		Call Environmental epidemiologist at 512-458-7269
Triorthocresyl phosphate	>72h	Gastroenteritis, leg pain, high stepping gait, foot and wrist drop	Cooking oil substitute, contaminated flour, fluid ginger extract, parsley extract (apiol)	Lubricating oil, certain plastic containers, hydraulic fluid	Oil specimen,[2] food[2]		Chemical analysis		Call Environmental epidemiologist at 512-458-7269
Listeria monocytogenes	varies 3-70d median 3w	Flu-like illness (F, chills, muscle aches, N, and/or D), meningitis, neonatal sepsis, cerebritis	Milk, meats, soft cheeses; manure fertilized vegetables	Soil, plants, water; food stored at 30-40 °F	Food,[2] stool,[2] blood,[1] CSF,[1] tissue biopsy[1]	100g food, 5g stool, 0.5ml serum, 10ml CSF	Culture,[1,2] identification,[1,2] typing[2]	Unpreserved stool in Cary-Blair; isolates shipped on nonglucose slants such as trypticase soy or heart infusion agar; all specimens kept at 4 °C (39 °F)	Specimens only accepted from public health officials
Taenia solium Cysticercus(i)	>2m	HA, N, V, seizures	Exposure to human stool or food contaminated with cysticerci	Humans	Blood,[3] CSF[1,3]	10ml blood or 5ml serum	MRI or CT detection of cysticerci (cysts) in the brain,[1] serological assay [1,2,3]	Red top test tube for serum	TDH forwards serum to CDC for cysticercosis serological assay

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Allergic (facial flushing, itching)									
Scombroid histamine	<1-3h usual <1h	HA, N, V, P, flushing, itching, peppery taste	Tuna, mackerel, skipjack, bonito, mahi mahi, blue fish	Partially decomposed fish	Fish[2]		Identification of decomposed fish		Call IDEAS at 512-458-7676 or TDH laboratory at 512-458-7318
Monosodium L-glutamate (food additive)	<1h	Mouth numbness, tingling, N, HA: in all when dose >1.5g (less in sensitive people)	Foods prepared with this ingredient	Not applicable	Food[2]		Chemical analysis		Call IDEAS epidemiologist at 512-458-7676
Generalized Infection (fever, chills, malaise, prostration, aches, swollen lymph nodes)									
Salmonella typhi	3d-3m usual 1-3w	Malaise, HA, F, N, V, P, rose spots	Meat, poultry, egg products	Human and animal intestinal tracts; food stored at >40 ºF	Stool,[2] food,[2] blood[1]	100g food (4oz)	Culture,[1] PFGE,[1] serotyping[2]	Collect a stool specimen from the case & ship to laboratory in buffered glycerol saline solution or Cary-Blair transport medium	Collect a stool specimen from the suspected carrier & ship to laboratory in buffered glycerol saline solution or Cary-Blair transport medium
Trichinella spiralis	5-45d usual 8-15d	Periorbital edema, gastroenteritis, F, labored breathing	Raw or undercooked meats containing encysted larvae	Swine, dogs, cats, horses, rats, many wild animals	Blood,[3] tissue biopsy,[2] food (meat)[2]	2 ml serum, 100g food (4oz)	Giemsa stain of tissue biopsy,[2] eosin stain of meat,[2] SAT,[1,2] Bentonite Flocculation[3]		TDH forwards serum to CDC. TDH assays food & tissue biopsy. Call TDH laboratory at 512-458-7318 prior to shipping specimen.
Brucella species	5-60d usual 1-2m	F, myalgia, malaise, HA, arthralgia	Raw milk, products from sheep, cows, goats	Cattle, swine, sheep, goats, deer, kennel dogs, coyotes	Stool,[1] food,[2] blood,[1] gastric washing[1]	2ml serum, 100g food (4oz)	Culture,[1] identification,[1] single and paired SAT[1,2]	Food specimens kept and shipped at 4 ºC (39 ºF); collect blood specimen in red top test tube	Specimens for testing accepted only from public health officials
Toxoplasma gondii	10-23d	F, HA, myalgia, rash	Contaminated foods	Cats, rats, birds, feces, dirt	Blood,[1,2] tissue biopsy[1,2]	2ml serum, 100g food (4oz)	Single serum EIA (IgM),[1] paired sera IFA (IgG),[1] giemsa stain of tissue[1]	Collect blood specimen in red top test tube	TDH lab support only available to epidemiologist to investigate outbreaks
Hepatitis A	15-50d mean 30d	F, N, C, anorexia, later dark urine, jaundice	Oysters, clams, food handled by infected person	Transmitted by fecal/oral route, person to person, shed in stool	Serum [1,2] **Unhemolyzed and not lipemic**	2ml serum	Total IgG,[1,2] single serum IgM anti-HAV[1,2]	Collect blood specimen in red top test tube. Ship at 4 ºC (39 ºF)	TDH lab support available only to epidemiologists to investigate outbreaks

h=hour d=day w=week m=month
C=abdominal cramps D=diarrhea F=fever GI=gastrointestinal HA=headache N=nausea P=abdominal pain V=vomiting
CSF=cerebrospinal fluid EIA=enzyme immunoassay IFA=indirect fluorescent antibody test PFGE=pulse-field gel electrophoresis SAT=serum agglutination test
^{N}C=degrees Centigrade ^{N}F= degrees Fahrenheit
IDEAS=Infectious Disease Epidemiology and Surveillance Division TDH=Texas Department of Health

[A] Initial (diagnostic) specimens should be routed to the local hospital laboratory and remaining or reference specimens to the Texas Department of Health (TDH) laboratory. TDH forwards certain specimens for testing to federal laboratories and results may not be available for weeks or months.

[B] Food samples for bacteriological analysis: collect a minimum of 100g (4 oz) and a maximum of 450g (1 lb) for each sample, store and ship in a sterile Whirl Pak bag or sterile plastic container at 0-4 ^{N}C (32-39 ^{N}F). Frozen foods should remain frozen, however. Send samples to laboratory as soon as the specific food is suspected as a vehicle of transmission. Shellfish samples need to be refrigerated at 0-4^{N} C (32-39 ^{N}F) and tested within 24h after collection. Alert the laboratory of need to test food sample and ask for further shipping instructions. Approximate conversions for food measures: 100g=4 ounces; 5ml=one teaspoon; 2ml=20-30 drops

[C] Oyster samples for brevitoxin assay need to be maintained in 100ml of 0.18N HCl per 150-200g (5-7 oz) of shucked oyster meat. Samples can be refrigerated or frozen during shipping.

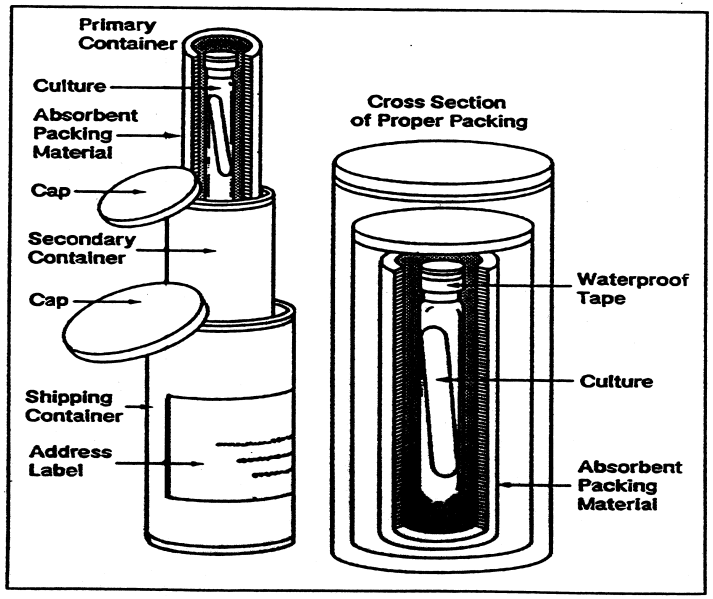
[D] Stool sample analyses require prior approval at (512) 458-7318; shipping containers can be obtained by calling (512) 458-7661; samples for bacteriological culturing are collected in a Cary Blair CultureSwab Transport System (in some cases an unpreserved fresh sample is needed); stool samples for intestinal parasites require division of the sample into two portions: one portion is placed into a vial of formaldehyde, the other in a vial of polyvinyl alcohol (O & P kit); the rectal swab may be shipped without a preservative, in a glycerol saline solution, or inoculated into a specific transport medium depending on the test. Samples may be refrigerated.

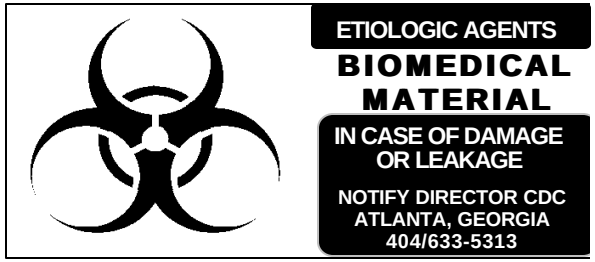
[E] General guidelines: (1) clinical human and animal specimens must be transported in a triple container; (2) the specimen container should hold no more than 50ml of specimen; therefore multiple containers may be necessary; (3) the secondary container must be a durable, screw-capped, leak-proof container and not a bag, and must have sufficient absorbent materials to absorb all the content of the primary container in case of leakage; and (4) the outside or tertiary container must be a fiberboard cylinder with a screw-capped lid or similar material. The inner specimen container must be labeled with the patient's name and or specimen identification number (form ID) exactly the way it is written on the laboratory request form. The proper complete laboratory forms must be included outside the second container. The outermost container must be labeled with the name of the laboratory, its full address, and a return full name and address. **Pure isolates of microorganisms require a biohazard label on the outermost container.**

[1] Initial diagnostic test done at local hospital, clinic, commercial, or nearest health department laboratory.
[2] Call the Texas Department of Health Laboratory (TDH) at (512) 458-7598 for submission, collection, and handling instructions; call (512) 458-7661 to obtain shipping containers for pure cultures.
[3] Reference test forwarded to Centers for Disease Control and Prevention (CDC) laboratory.

(TDH, ON11/98, fbichr11.wpd)

Packaging and Labeling of Samples[E]





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